A guide for the interoperability of Cultural Heritage Data in INSPIRE

Carlos Fernández[1], Isabel del Bosque[1], Juan Manuel Vicent[2], Esther Pérez[1], Alfonso Fraguas[2], Antonio Uriarte[2], Pastor Fábrega-Álvarez[3] and César Parcero-Oubiña[3]

[1]Unidad SIG (CCHS – CSIC). Spanish National Research Council, Madrid, Spain
[2]Instituto de Historia (CCHS – CSIC). Spanish National Research Council, Madrid, Spain
[3]Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC), Santiago de Compostela, Spain

Contents

1. Introduction
   - Protected Sites
   - Cultural Heritage Data
2. Cultural Application Schema
   - Interoperability
   - An extension of Protected Sites
   - The legal part
   - The real – world entities
   - Chronology
3. Conclusion

Introduction

1. Introduction

Protected Sites

- The INSPIRE Directive includes ***Protected Sites*** in its Annex I, which means that they are considered as reference data.

  INSPIRE defines a *protected site* as an "*area designated or managed within a framework of international, Community and Member States' legislation to achieve specific conservation objectives*".

- Nevertheless, the development of the *Protected Sites* theme is mostly oriented to environmental / natural issues.

  A specific development for ***Cultural Heritage*** information will help to overcame adaptation difficulties.

1. Introduction

Cultural Heritage Data

Cultural Heritage sites are a particular kind of Protected Sites

Spanish Cultural Heritage data: internal issues

- Lack of standardization
- Heterogeneous integration in Information Systems (due to an heterogeneous management by different regional government agencies)
- A wide variety of things are regarded as Cultural Heritage:

•A church	•An hypogeum	•A traditional feast
•A wall	•A forest	•An archeological site
•Rock Art	•A pilgrims way	•…

1. Introduction

Cultural Heritage Data

Cultural Heritage sites are a particular kind of Protected Sites

Cultural Heritage as geographical data:

- Lack of georeferenced data
- A small part of Cultural Heritage has a spatial nature
- Problematic adaptation of Protected Sites to the thematic scope of Cultural Heritage data

Hence the necessity to build an **interoperability schema**

1. Introduction

Working Group

GT-IDEE (Working Group of the Spanish Spatial Data Infrastructure):

- Applies, develops and extends INSPIRE in the Spanish context.
- Articulated by several workgroups devoted to specific issues.

GTT-PAH (Thematic Working Group on Cultural Heritage):

- Interdisciplinary group, set up by experts on Geomatics and Cultural Heritage (through 2010-2011).
- It has developed an interoperability framework for cultural heritage data.

This interoperability framework is expressed as an **application schema**, that contains the complete and precise definition of the content and structure of a data set (in our case, georeferenced cultural heritage data).

1. Introduction

Working Group

SPANISH SDI THEMATIC WORKING GROUP

The work presented corresponds to a collective authorship, in which many individuals and organizations have contributed as experts in the different tasks of the development of this Conceptual Data Model for Cultural Heritage

Juan M. Vicent García and Isabel del Bosque González from the *Centro de Ciencias Humanas y Sociales (CCHS)* of the *Consejo Superior de Investigaciones Científicas (CSIC)* as coordinators; Alfonso Fraguas Bravo, Antonio Uriarte González, Juan Luis Pecharromán Fuente and María Ruiz del Árbol Moro from the *Instituto de Historia (IH-CCHS-CSIC)*; Emilio Abad Vidal from the *Centro de Supercomputación de Galicia*; Francisco García Cepeda from the *Dirección General del Catastro*; Marta Criado Valdés from the *DMS Group;* Pilar Chías Navarro and Tomás Abad Balboa from the *Universidad de Alcalá de Henares*; Miguel Lage Reis-Correia from the *Fundación Las Médulas – Junta de Castilla y León*; Javier Márquez Piqueras from the *IDR–Universidad de Albacete*; Victorino Mayoral Herrera from the *Instituto de Arqueología de Mérida – CSIC;* Pastor Fábrega-Álvarez and César Parcero-Oubiña from the *Instituto de Ciencias del Patrimonio (*Incipit – CSIC); Carlos Fernández Freire and Esther Pérez Asensio from the *Unidad de SIG (CCHS-CSIC)*; José Julio Zancajo Jiménez from the *Universidad de Salamanca* and Antonio Vázquez Hoenhe, Arantza Respaldiza Hidalgo and Mercedes Farjas Abadía from the *Universidad Politécnica de Madrid.*

The Cultural Heritage Application Schema

2. The Cultural Application Schema

Overview

Generic: to embrace any kind of cultural heritage georeferenced data.

Extendable: to allow any kind of data producer to adapt the model to the nature of their own information.

Interoperable: to combine spatial data sets from different sources through network services, via Internet.

2. The Cultural Application Schema

Interoperability

Geographic information:

ISO 19100 series

- ISO 19101, 19103, 19109: Application schema development
- ISO 19108: Temporal Schema

INSPIRE

- Data Specification on Protected Sites
- Methodology for the development of data specification, Generic Conceptual Model…

2. The Cultural Application Schema

Cultural entities:

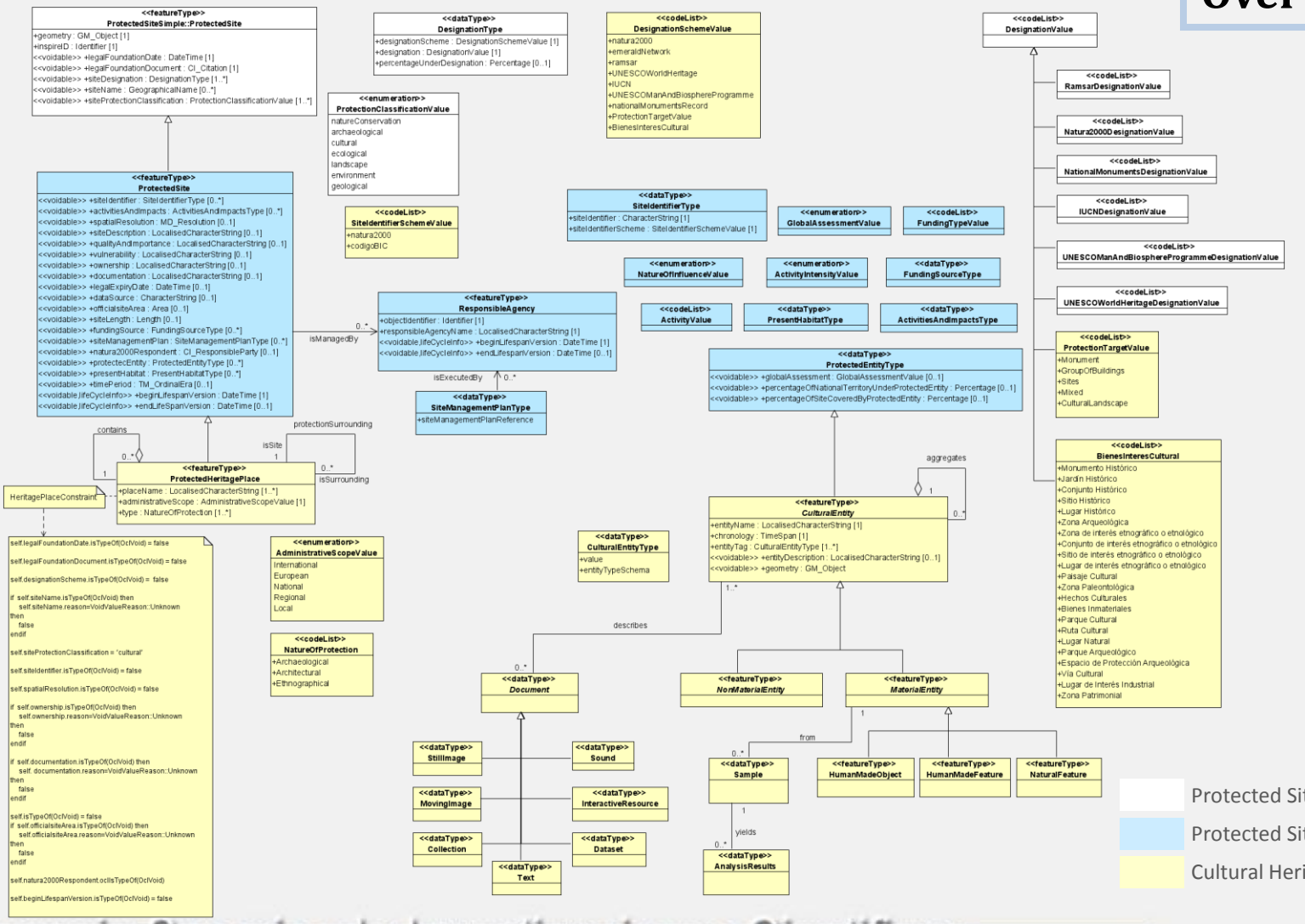
CIDOC Conceptual Reference Model (CRM) – ISO 21127:2006: "for describing the implicit and explicit concepts and relationships used in cultural heritage documentation".

Information resources (documents):

Dublin Core Metadata Initiative (DCMI) – ISO 15836:2009: Definition of a basic metadata element set for simple and generic resource descriptions.

2. The Cultural Application Schema

Overview



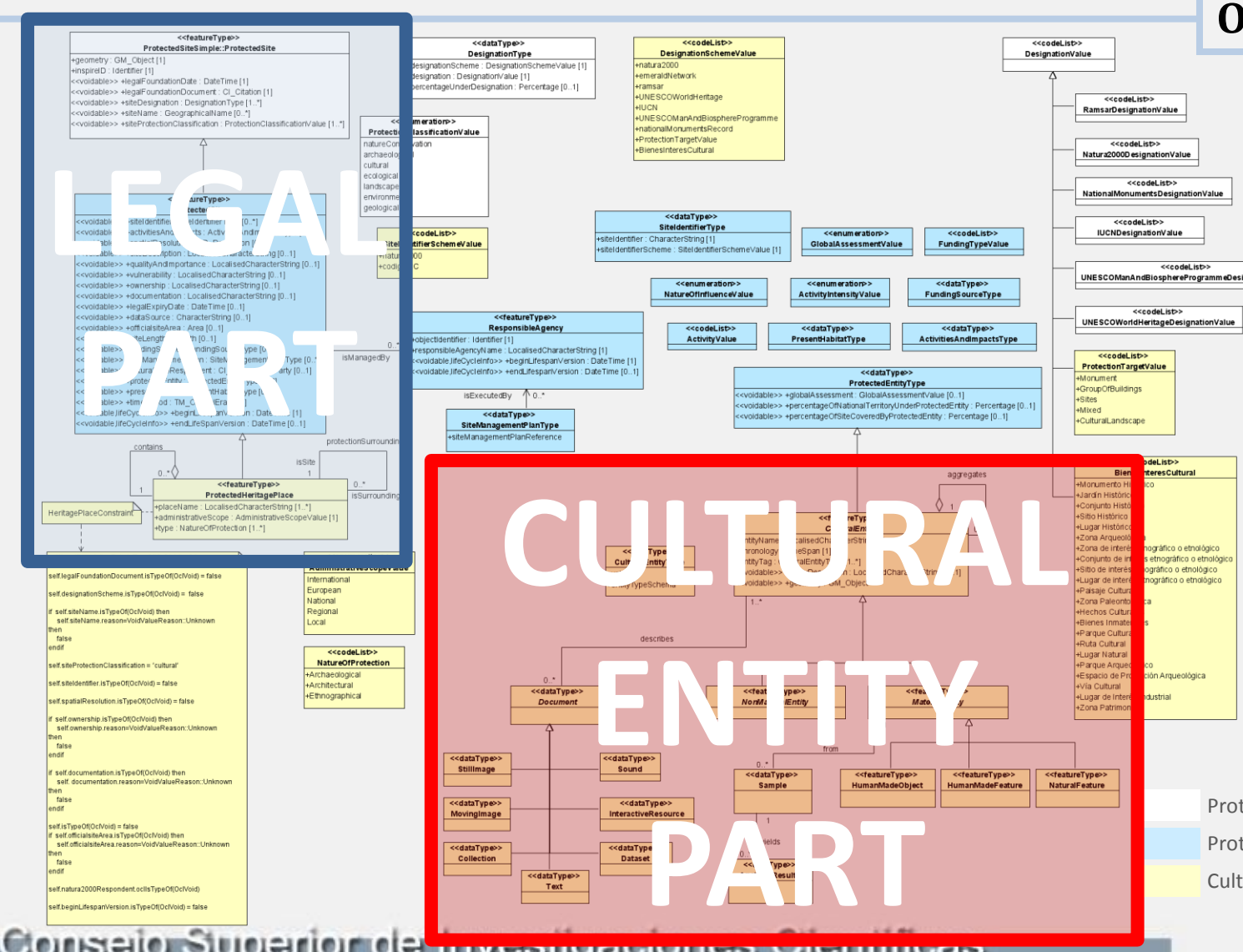
Protected Sites Simple entities

Protected Sites Full entities

Cultural Heritage proposed entities

2. The Cultural Application Schema

Overview



2. The Cultural Application Schema

PS. Extension

Protected Sites Data Specification

Developed by the 'Thematic Working Group Protected sites'.

Two Application Schemas:

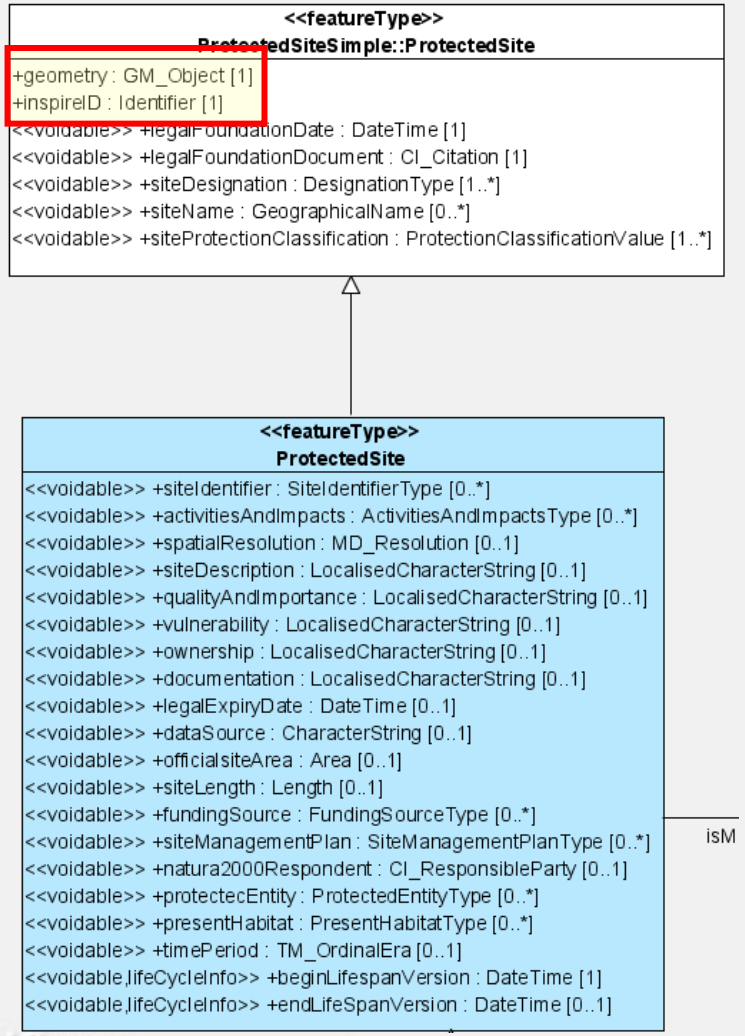
- Simple
- Full

Only two non *voidable* attributes:

- geometry
- inspireID

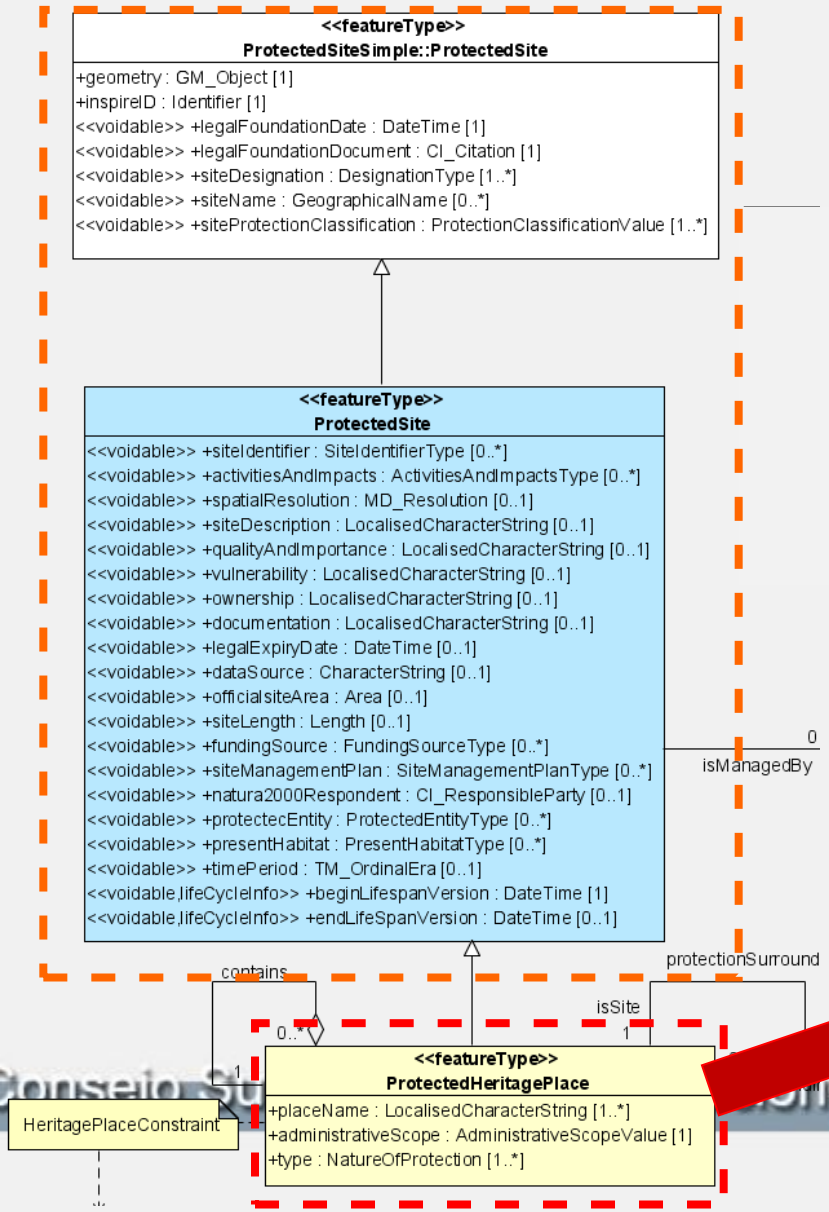
Centered mainly on:

- Legal aspects
- Natural protected sites (e.g. Natura2000)



2. The Cultural Application Schema

Legal Part



Legal part: ProtectedHeritagePlace

New class: ProtectedHeritagePlace, built as an extension of ProtectedSites.

Area dedicated to the protection of cultural resources and managed through legal and administrative means.

It is the only mandatory entity.

It is a subclass of *ProtectedSite* entity: Establishes a subtype of protected site, specifically related to cultural features.

<<featureType>>
ProtectedHeritagePlace

+placeName : LocalisedCharacterString [1..*]
+administrativeScope : AdministrativeScopeValue [1]
+type : NatureOfProtection [1..*]

2. The Cultural Application Schema

Legal Part

ProtectedHeritagePlace

Mandatory attributes:

1. From *ProtectedSite* (mandatory in origin)
2. From *ProtectedSite* (mandatory through constraints)
3. Specific from *ProtectedHeritagePlace*

<<featureType>>
ProtectedHeritagePlace

+geometry : GM_Object	1
+inspireID : Identifier	
+legalFoundationDate : DateTime	2
+legalFoundationDocument : CI_Citation	
+siteDesignation : DesignationType	
+siteProtectionClassification : ProtectionClassificationValue	
+siteIdentifier:SiteIdentifierType	
+spatialResolution : MD_Resolution	
+dataSource : CharacterString	
+beginLifespanVersion : DateTime	
+placeName : LocalisedCharacterString	3
+administrativeScope : AdministrativeScopeValue	
+type : NatureOfProtection	

2. The Cultural Application Schema

Legal Part

Identification attributes

inspireID	External object identifier of the protected heritage place (according INSPIRE).	1
siteIdentifier	The identifier for the cultural heritage site using some national or international identification scheme.	1..*

Spatial attributes

geometry	The geometry defining the boundary of the protected heritage place (that defined by the admistration responsible for the protection and management).	1
placeName	Place name of the protected heritage place (that used in the legal foundation document).	1
spatialResolution	The spatial resolution of the cultural heritage place geometry. Expressed as equivalent scale or distance.	1

Life cycle Attributes

beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	1

2. The Cultural Application Schema

Legal Part

Legal and administrative issues attributes

legalFoundationDate	The date that the protected heritage place was legally created.	1
legalFoundationDocument	Reference of the legal act that created the protected heritage place (URL or text citation).	1
siteDesignation	The designation (type) of protected heritage place. Designations may be available using a number of different designation schemes (all of which can be accommodated in the *DesignationSchemeValue* codelist).	1..*
siteProtectionClassification	The classification of the protected heritage place based on the purpose for protection. Always set to “cultural”.	1
administrativeScope	Administrative scope of the legal definition of the cultural heritage place.	1
dataSource	The agency or organization that is responsible for maintaining and providing the data about the protected heritage place.	1
type	Reason advocated for the site's protection.	1..*

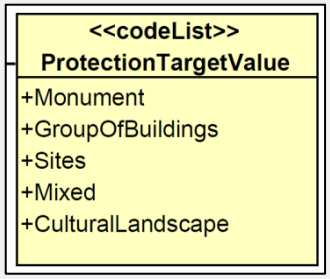
2. The Cultural Application Schema

Legal Part

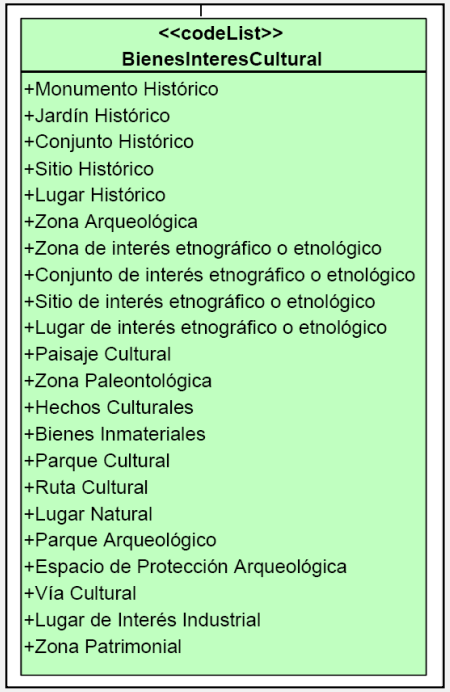
***siteDesignation* schemes:**

UNESCOWorldHeritageDesignationValue

ProtectedTargetValue: Type of Protected Heritage Place according to the last UNESCO "Operational Guidelines for the Implementation of the World Heritage Convention".



***BienesInteresCultural*:** Highest protection that Spanish heritage administrations can give.

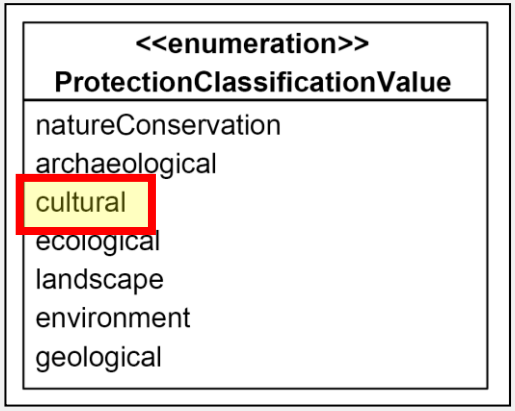


Other schemes can be added…

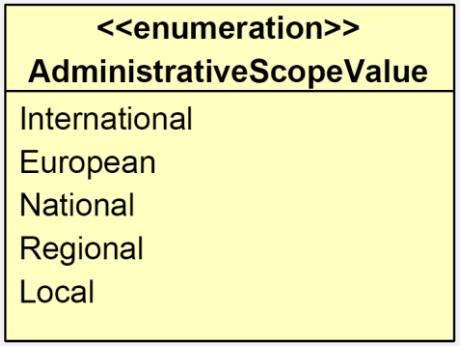
2. The Cultural Application Schema

Legal Part

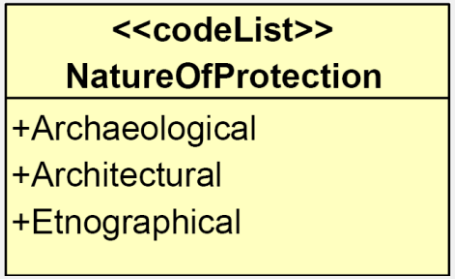
siteProtectionClassification



administrativeScope



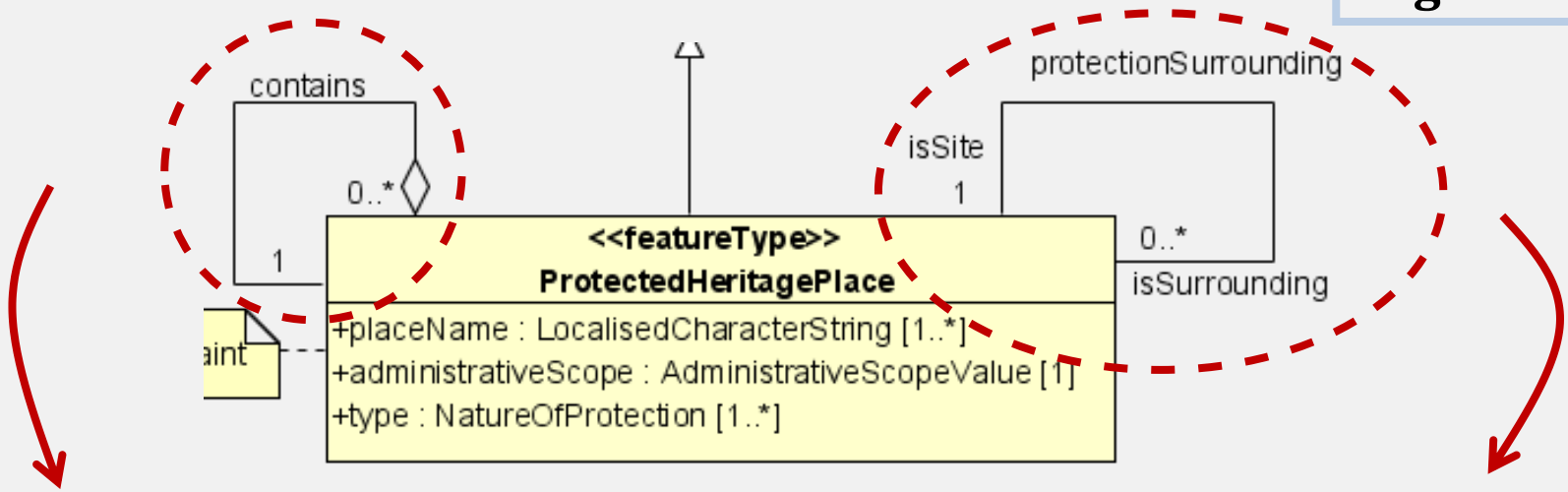
siteProtectionClassification



New categories can be added

2. The Cultural Application Schema

Legal Part

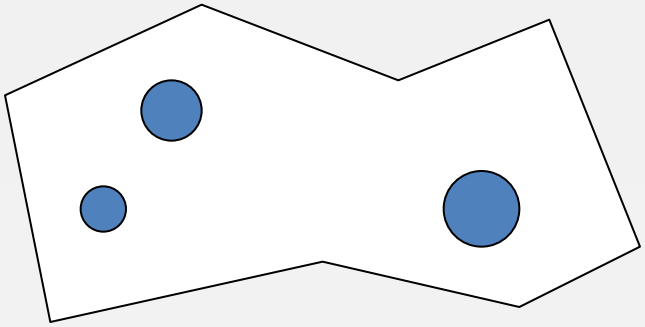


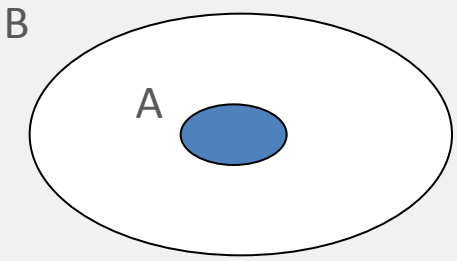
A cultural heritage place can be contained by another.

Relationship between a certain protected heritage place (A) and its corresponding protection surrounding (should there be) (B).

e.g., Protection of historic landscape

Protection of archaeological sites

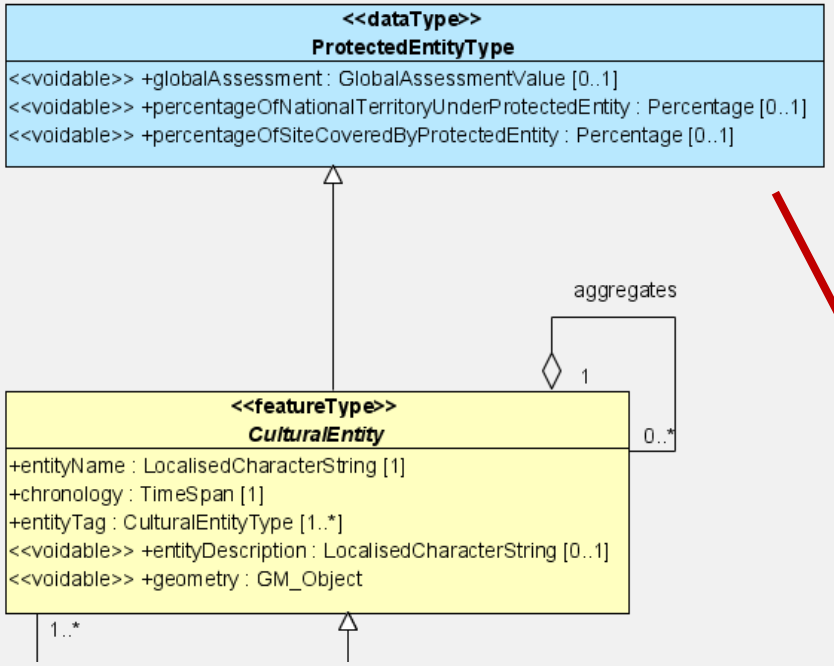


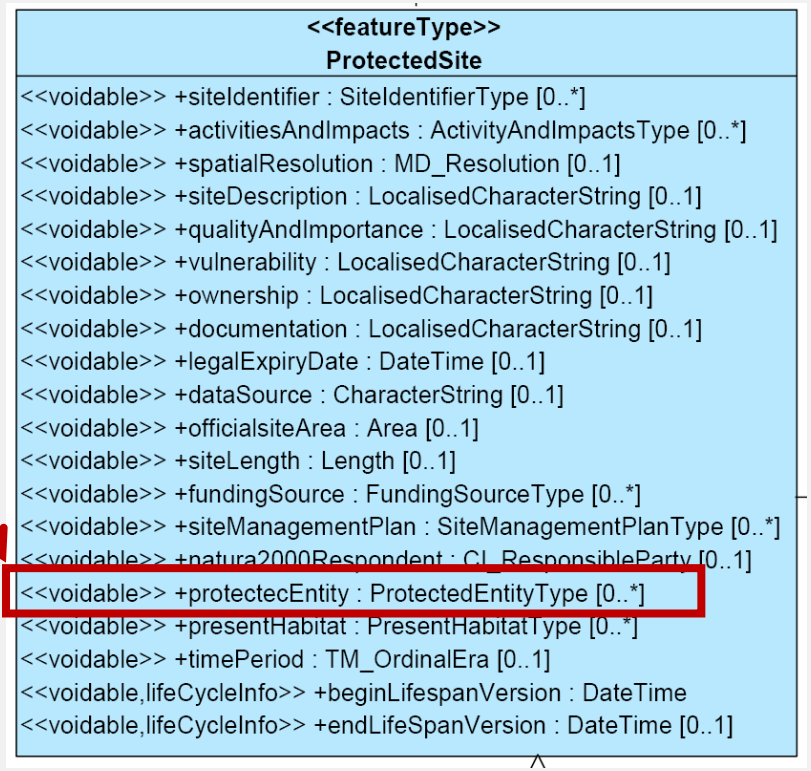


2. The Cultural Application Schema

Real – world entity

A Cultural Entity is any real-world feature result of human action protected by a legal figure



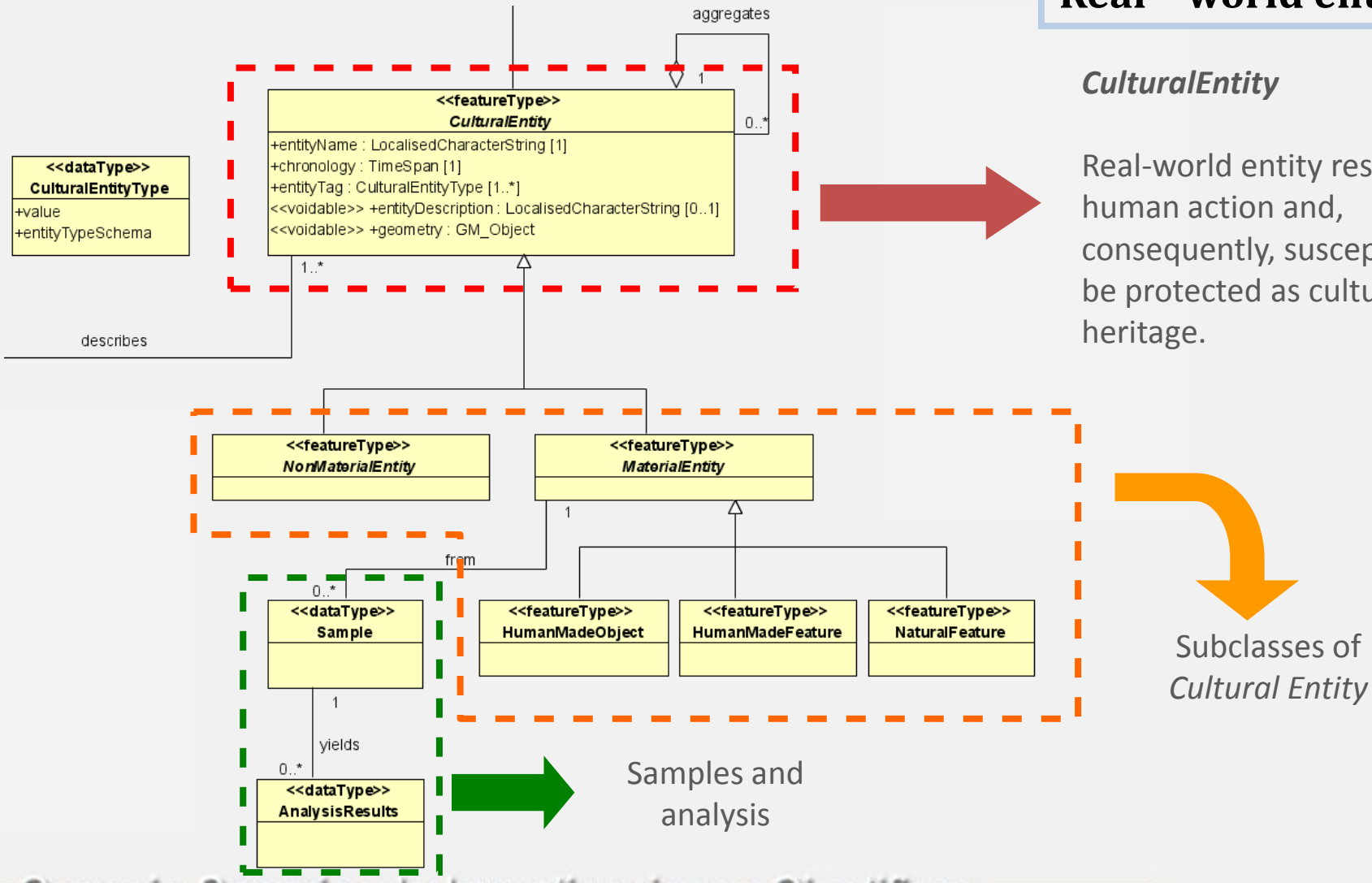


CulturalEntity is a subclass of **ProtectedEntityType** (preexisting class in the *Data Specification on Protected Sites*), that is, any kind of a real world feature susceptible of legal protection.

ProtectedEntityType is related to **ProtectedSite**.

2. The Cultural Application Schema

Real – world entity



CulturalEntity

Real-world entity result of human action and, consequently, susceptible to be protected as cultural heritage.

Subclasses of *Cultural Entity*

Samples and analysis

2. The Cultural Application Schema

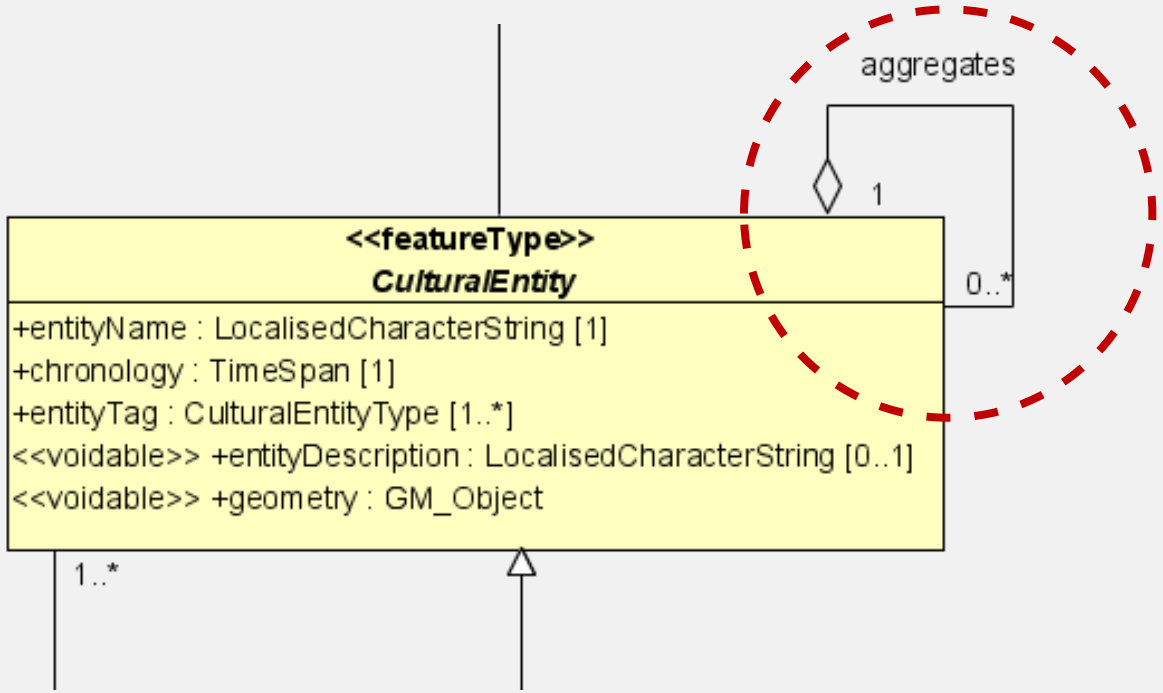
Real – world entity

CulturalEntity attributes

entityName	Name of the entity.	1
chronology	According to ISO 19108 Geographic information - Temporal schema.	1
entityTag	Assigns a certain cultural value or category (chronological, functional…) to the cultural entity. The cultural value must belong to a certain scheme or classification (e.g. a thesaurus).	1..*
entityDescription	Textual description of the cultural entity.	0..1
geometry	Spatial definition of the cultural entity. The data provider does not necessarily have to assign a geometry to a specific cultural entity.	0..1

2. The Cultural Application Schema

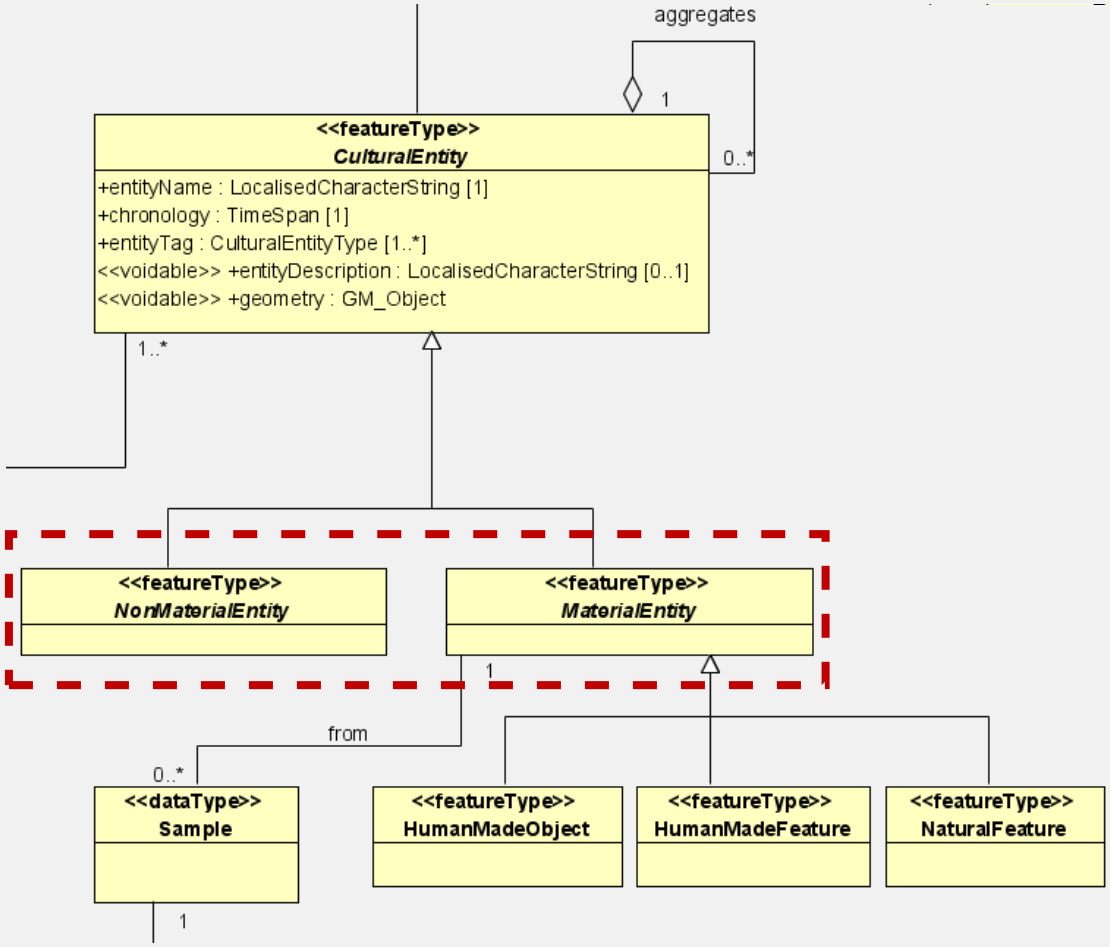
Real – world entity



A cultural entity can be broken down into its parts or taken as a whole

2. The Cultural Application Schema

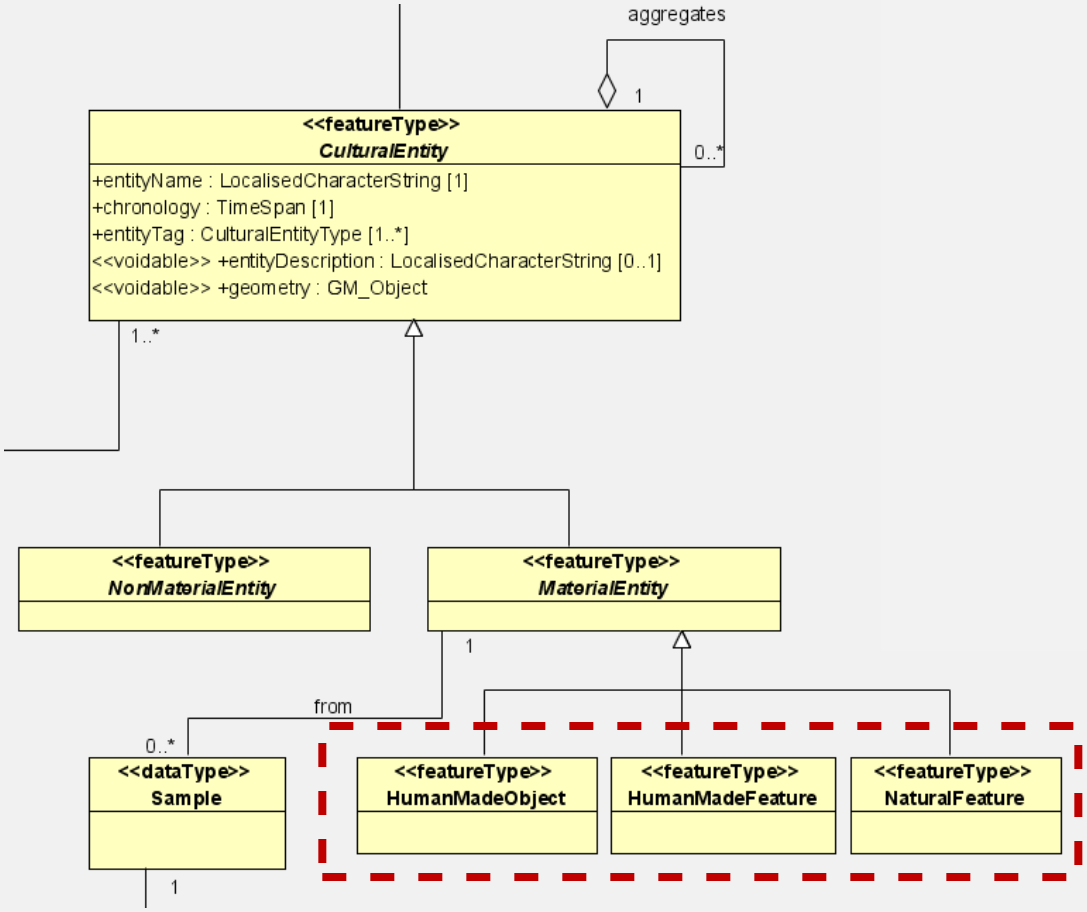
Real – world entity



Cultural Entity subtypes:

- *MaterialEntity*: Cultural entity with tangible materiality.
- *NonMaterialEntity*: Living cultural activity, whose existance depends on performance.

2. The Cultural Application Schema



Real – world entity

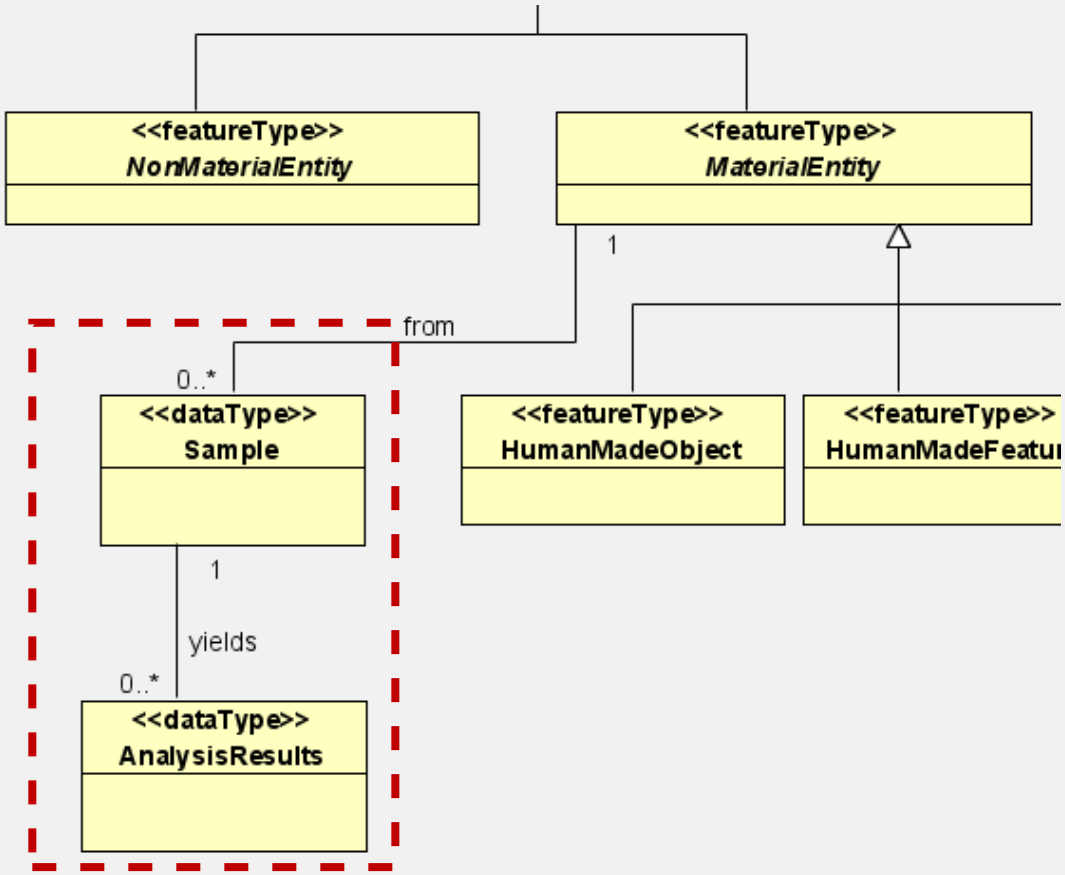
According to CIDOC Conceptual Reference Model (CRM).

Subclasses:

- *HumanMadeObject*: physical feature created by human activity and that is physically from other objects.
- *HumanMadeFeature*: feature product of human activity integrated inside other objects.
- *NaturalFeature*: landscape feature singularly identifiable.

2. The Cultural Application Schema

Real – world entity



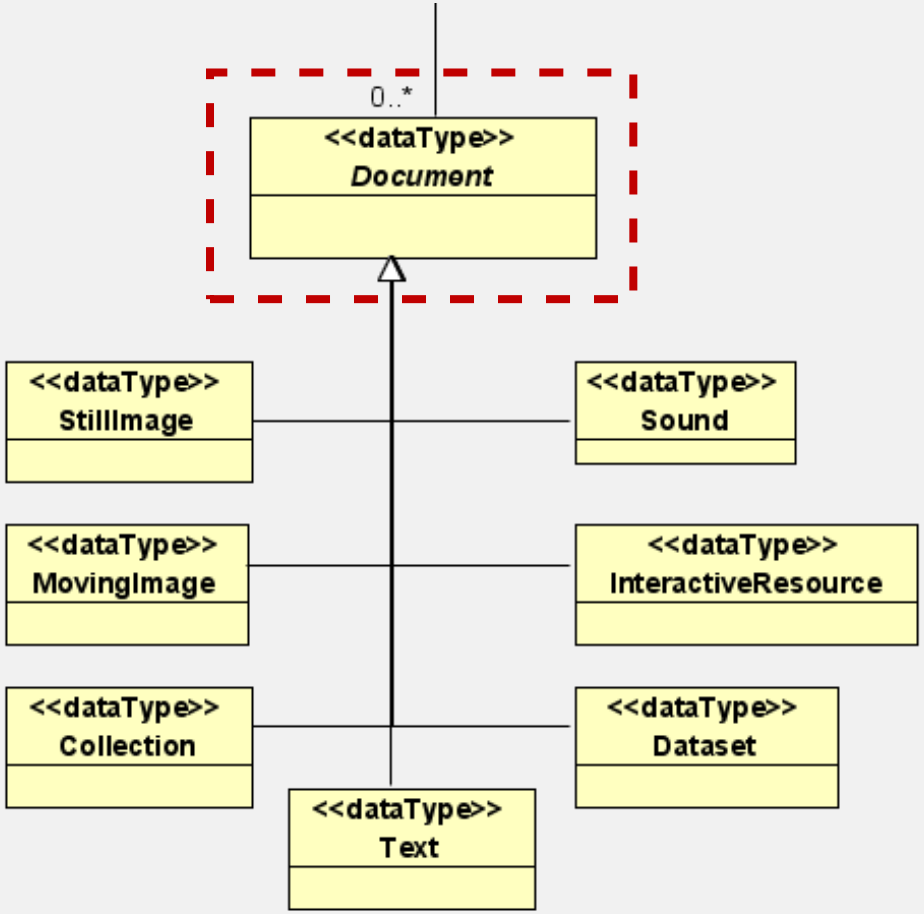
This part enables the inclusion of analytical results taken on cultural material entities.

Sample: Fraction taken from a cultural material entity in order to develop analysis.

AnalysisResults: Results of the analysis carried out on a specific sample.

2. The Cultural Application Schema

Real – world entity



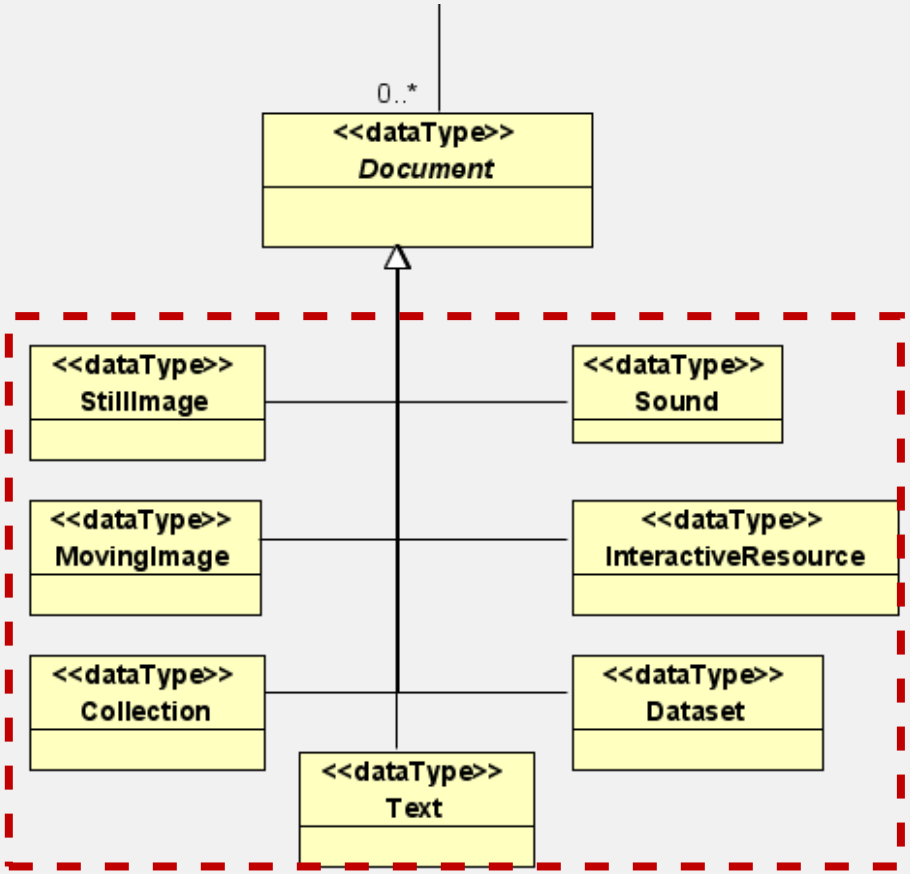
Document

Resource that contains information (in this case, about one or several cultural entities).

According to Dublin Core Metadata Initiative.

2. The Cultural Application Schema

Real – world entity



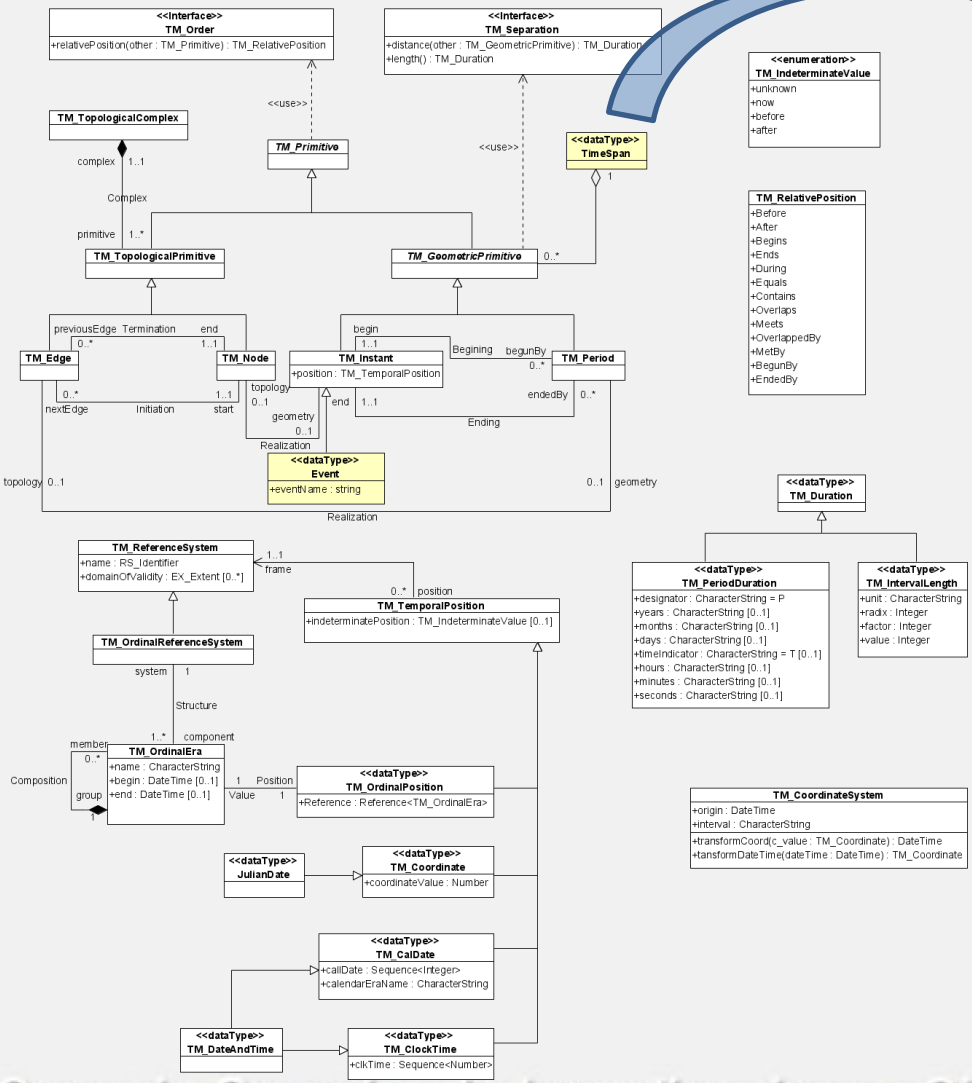
According to the *type* attribute of the Dublin Core Metadata Element Set.

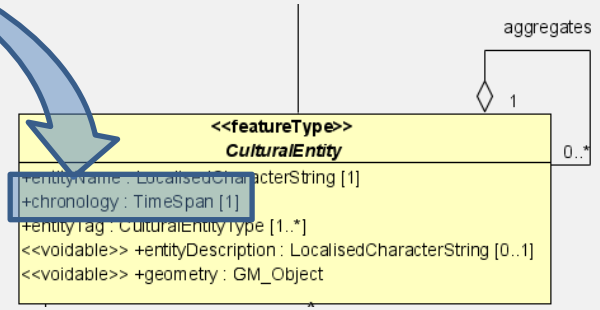
Seven subclasses of documents:

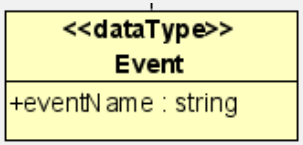
- *Text*: Primarily formed by words for reading.
- *StillImage*: Visual representation of static nature.
- *MovingImage*: Series of visual representation offering an impression of motion.
- *Sound*: Acoustic representation.
- *Dataset*: Set of data stored in a structured way (e.g. a table).
- *InteractiveResource*: Resource requiring interaction from the user.
- *Collection*: Aggregation of resources.

2. The Cultural Application Schema

Chronology







Creation, Occupation, Abandonment, Modification, Restoration…

Conclusion

3. Conclusion

- Interoperable schema for cultural heritage in the framework of INSPIRE European initiative for the standardisation and distribution of georeferenced data.

- Specificity of cultural places as compared with natural areas.

- Distinction between cultural entities (as real world things) and protected places (as administrative realities).

We hope that this work might be helpful for a future development of Cultural Heritage SDIs in an interoperable framework based on OGC Standards

3. Conclusion

Implementation

Future implementations

IDEARQ (Spanish National Research Council – CSIC)

- Different archaeological datasets: Radiocarbon, Metallurgy, Rock Art
- Supported by CONSOLIDER INGENIO 2010 (CSD2007-00058)

IDEPatri (CESGA, LBS, GEPN)

- Iron Age archaeological record in Galicia
- Supported by INCI.TE

Thank you for your attention

Carlos Fernández Freire

Unidad de SIG
Centro de Ciencias Humanas y Sociales (CCHS)
Consejo Superior de Investigaciones Científicas (CSIC)
carlos.ffreire@cchs.csic.es